REMARKS

Claims 1-9 are currently pending. Reexamination and allowance of the pending claims are respectfully requested.

In the Advisory Action dated August 14, 2008, claims 1-9 are rejected under 35 USC 102(b) as being anticipated by Lee et al. (Lee), US Patent No. 6,138,025. The rejection is respectfully traversed.

Claim 1

In independent claim 1, the registration areas are determined according to dynamic partition units, that is, the second registration areas are determined according to the first partition units, while the third registration areas are determined according to the second partition units. More specifically, the second registration areas are determined by performing a registration area determining procedure according to the mobility data corresponding to the first partition units, and each second registration area comprises at least one first partition unit; the third registration areas are determined by performing the registration area determining procedure according to the mobility data corresponding to the second partition units, and each third registration area comprises at least one second partition unit. Further, at least one of the second partition units is generated by combining at least two of the first partition units when the overall cost of the first registration areas is lower than or equal to the overall cost of the second registration areas, and at least one of the second partition units is generated by partitioning one of the first partition units when the overall cost of the first registration areas is higher than the overall cost of the second registration areas. That is, the size and the boundary of the partition unit can be dynamically adjusted according to the comparison of overall costs of the registration areas. In this way, the situation of "local minimum" can be avoided (please see [0018]~[0019] of the specification of the present application).

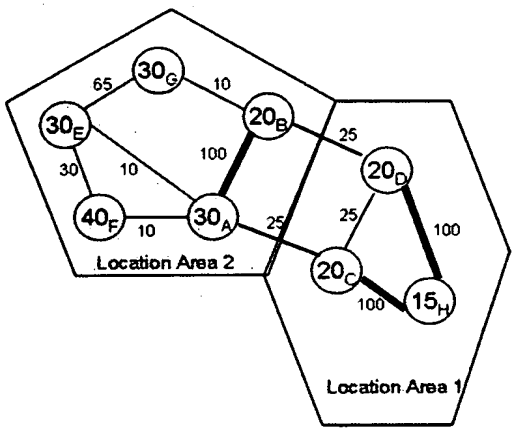
For instance, in FIG.4 of the present application, nodes 1-10 are to be partitioned into registration areas. Each node represents a partition unit, e.g. a cell, each label attached on a node represents the paging load of the node, and each number attached

on a link represents the location update (LU) load between two nodes. After performing a KL/FM-based algorithm, the result is shown in FIG.7, where four registration areas D, F, H and I are determined. Since the registration areas subsequently determined cannot generate a lower overall LU load (i.e. the overall cost of the first registration areas is lower than or equal to the overall cost of the second registration areas, as described in claim 1), at least one of the new partition units (i.e. second partition units) is determined by combining the original partition units (i.e. first partition units), e.g. nodes 1 and 4 are merged, and the paging load and LU load are also re-calculated, as shown in FIG.9. Then, the KL/FM-based algorithm is performed again based on the new partition units (i.e. the partition units are dynamically adjusted during the process of determining the registration areas), and the result is shown in FIG.10. Since a lower overall LU load is obtained (i.e. the overall cost of the first registration areas is higher than the overall cost of the second registration areas, as described in claim 1), the merged partition units are partitioned into the previous partition units, as shown in FIG.11.

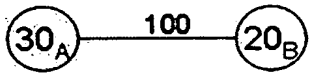
However, the method for determining registration areas according to dynamic partition units as described in claim 1 is not disclosed or suggested by Lee. In Lee, the VMLAs are determined based on single cells. As shown in FIG.7A of Lee, the best cell is moved from the greater loaded VMLA to the lesser loaded VMLA, so as to obtain VMLAs with balanced loads. Though the best pair of cells is considered in FIG.7B, it is used for cell swapping. That is, the two cells in the best pair belong to different VMLAs, and are swapped between the different VMLAs to reduce the number of VMLA registrations. Thus, it is also in nature a singe cell moved from a VMLA to another.

Thus, Lee fails to teach or suggest all of the limitations claimed in independent claim 1, so claim 1 is submitted to be in condition for allowance. Claims 2-9 depend from claim 1 and are submitted to be allowable for the same reasons.

Below we will show an example for explaining the difference between Lee's solution and the invention of claim 1 (referred as Dynamic Partition Unit (DPU) algorithm below).
We assume the network with initial states and its location areas as below graph.



We assume:



This means the Cell A with 30 paging contribution, 20 paging of Cell B. And the number 100 on the edge is the mobility between each pair of the Cells. If the mobility cross the border of location Area, that will become registration load for the correlative location areas. Here we assume that from A to B has 100 mobility loading and also from B to A has 100 mobility loading, and we will denote this by $100_{A\text{-}B}$.

And following Lee's measure loading of VMLA (Eq. 14, column10, line10-20),

Load (VMLA)= $\sum_{a \in VMLA} node\_wt(a) + \underset{c \in VMLA}{Max} \{edge\_wt(c,c) + \sum_{b \notin VMLA} edge\_wt(b,c)\}$

To simplify the Load (VMLA), we denote $node\_wt(a)$ be the paging contribution of Cell a $edge\_wt(c,c)$ be 0 and $\sum_{b \notin VMLA} edge\_wt(b,c)$ be the cross area mobility (registration)

And we assume each LA with loading capacity (Paging and Registration) 250.

So we can calculate the initial loading of LA1 & LA2 as follow:

LA1:

Paging Load = $20_C+20_D+15_H$ =55.

Registration Load = $25_{A\text{-}C}+25_{B\text{-}D}$=50.

Load (LA1) =55+50 = 105.

LA2:

Paging Load = $30_A+20_B+30_E+40_F+30_G$=150.

Registration Load = $25_{A\text{-}C}+25_{B\text{-}D}=50$.

Load (LA2) =150+50 = 200.

Total Loading of Network = 105+200 = 305.

The Network is unbalanced!

Using Lee's solution (US 6,138,025) Fig7 (**Step702-Step710**) it will move the cell from greater loaded LA to lesser loaded LA.

Case 1: Move A to LA 1.

Case 2: Move B to LA 1.

Case 3: Move F to LA 1.

[Case 1]: Move A to LA 1.

Loading of LA1:

Paging Load of LA1 = $30_A+20_C+20_D+15_H$ =85.

Registration Load of LA1 = $10_{A\text{-}F}+10_{A\text{-}E}+100_{A\text{-}B}+25_{B\text{-}D}=145$.

Load (LA1) = 85+145 = 230.

Loading of LA2:

Paging Load of LA2 = $20_B+30_E+40_F+30_G=120$

Registration Load of LA2 = $10_{A\text{-}F}+10_{A\text{-}E}+100_{A\text{-}B}+25_{B\text{-}D}=145$

Load (LA2) = 120+145 =265 (**Over capacity 250**)

Total loading of network is 230+265= 495, (Initial total load is 305, **not improved.**)

This Case will become more balance but not improving the total loading of network. Step 708 Checking this state will return to Step704, choose another case for move.

[Case 2]: Move B to LA 1

Loading of LA1:

Paging Load of LA1 = $20_B+20_C+20_D+15_H$ =75.

Registration Load of LA1 = $100_{A\text{-}B}+25_{B\text{-}D}+10_{B\text{-}G}=135$.

LA (LA1) = 75+125 = 200.

Loading of LA2:

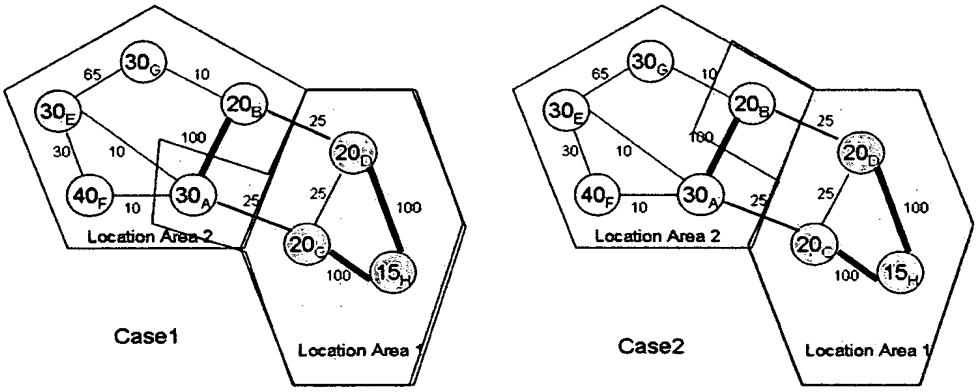
Paging Load of LA2 = $30_A+30_E+40_F+30_G=130$.

Registration Load of LA2 = $100_{A-B}+25_{A-C}+10_{B-G}=135$.

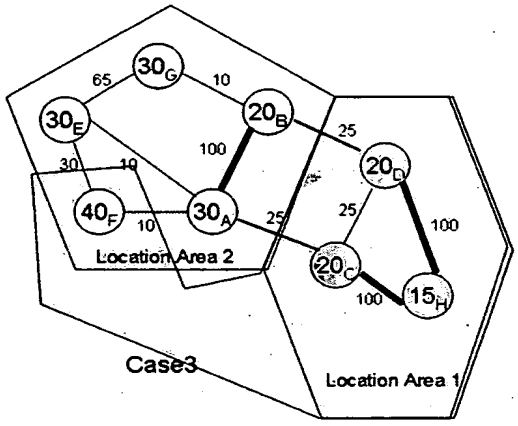
Load (LA2) = 130+135 =265. **(Over capacity 250)**

Total loading of network is 200+265= 465, (Initial total load is 305, **not improved.**)

This Case will become more balance but not improving the total loading of network. Step 708 Checking this state will return to Step704, choose another case for move.



Graph for Case1 and Case2: Colored Area is new LA1



Graph for Case 3: Colored area is new LA1

[Case 3]: Move F to LA1

Loading of LA1:

Paging Load of LA1 = $40_F+20_C+20_D+15_H$ =95.

Registration Load of LA1 = $25_{A-C}+25_{B-D}+10_{A-F}+30_{E-F}=90$.

Load (LA1) = 95+90 = 185.

Loading of LA2:

Paging Load of LA2 = $30_A+30_E+20_B+30_G=110$.

Registration Load of LA2 = $25_{A-C}+25_{B-D}+10_{A-F}+30_{E-F}=90$.

Load (LA2) = 110+90 =200.

Total loading of network is 185+200=385. (Initial total load is 305, **not improved.**)

In this Case, it still for the total loading of network is not improved. Step 708 Checking this state will return to Step704, choose another case for move.

We still can have other Cases for moving E or G into LA1. But Those are also bad cases for adding registration load and total network loading is increased,.

Using Lee's solution (US 6,138,025) Fig7 (**Step714 to Ste722**), it will swap the cell between LAs.

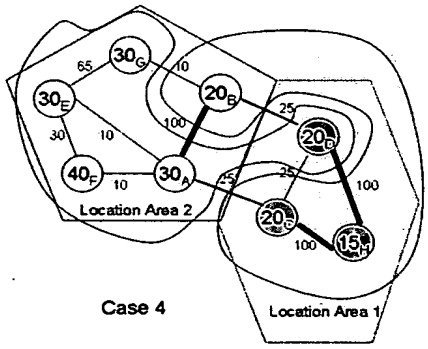
Case 4: Swap B, D

Case 5: Swap B, C

Case 6: Swap A, C

Case 7: Swap A, D

Case 8: Swap H, F ...



Case 4

[Case 4]: Swap B, D

Loading of LA1:

Paging Load of LA1 = $20_B+20_C+15_H$ =55.

Registration Load of LA1 = $10_{B-G}+100_{A-B}+25_{B-D}+100_{D-H}+25_{C-D}+25_{A-C}=285$.

Load (LA1) = 55+285 = 340. (**Over capacity 250**)

Loading of LA2:

Paging Load of LA2 = $30_A+40_F+30_E+30_G+20_D$ =150.

Registration Load of LA2 =$10_{B-G}+100_{A-B}+25_{B-D}+100_{D-H}+25_{C-D}+25_{A-C}=285$.

Load (LA2) = 150+285=435. (**Over capacity 250**)

Total loading of network is 340+435=775. (Initial total load is 305, **not improved.**)

This case is not improved the total loading of network. Therefore, the step will return to Step 716.

[Case 5]: Swap B, C

Loading of LA1:

Paging Load of LA1 = $20_B+20_C+15_H$ =55.

Registration Load of LA1 = $10_{B-G}+100_{A-B}+25_{C-D}+100_{C-H}$ =235.

Load (LA1) = 55+235 = 290. **(Over capacity 250)**

Loading of LA2:

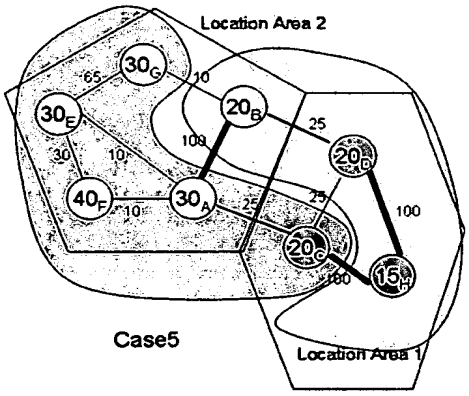
Paging Load of LA2 = $30_A+40_F+30_E+20_C+30_G$=150.

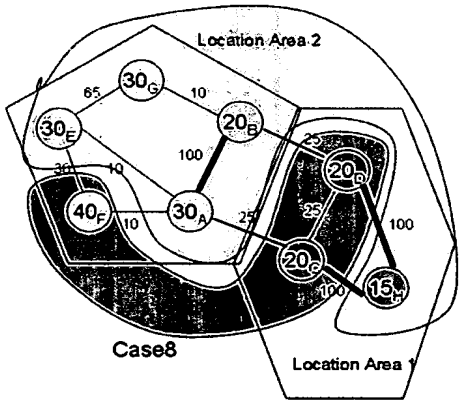
Registration Load of LA2 = $10_{B-G}+100_{A-B}+25_{C-D}+100_{C-H}$ =235.

Load (LA2) = 150+235=385. **(Over capacity 250)**

Total loading of network is 290+385=675. (Initial total load is 305, **not improved.**)

This case is also not improved the total loading of network. Therefore, the step will return to Step 716.





Case 6 & 7 is similar to Case 4~5 ,

[Case 8]: Swap H , F

Loading of LA1:

Paging Load of LA1 = $20_D+20_C+40_F$ =80.

Registration Load of LA1 = $30_{E-F}+10_{F-A}+25_{A-C}+25_{B-C}+100_{C-H}+100_{D-H}$ =290.

Load (LA1) = 80+290 = 370. **(Over capacity 250)**

Loading of LA2:

Paging Load of LA2 = $30_A+15_H+30_E+20_B+30_G=125$.

Registration Load of LA2 = $30_{E-F}+10_{F-A}+25_{A-C}+25_{B-C}+100_{C-H}+100_{D-H}$ =290.

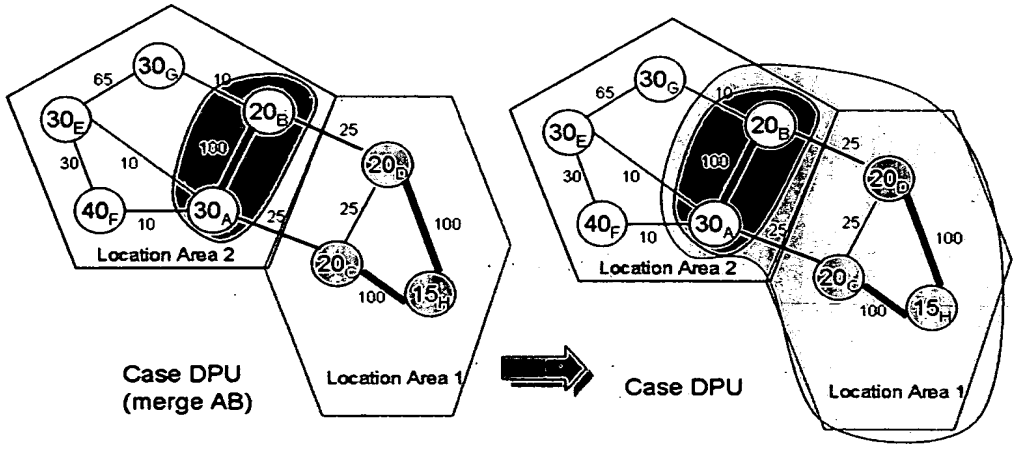
Load (LA2) = 125+290=415. (**Over capacity 250**)

Total loading of network is 370+415=785. (Initial total load is 305, **not improved.**)

This case is also not improved the total loading of network. Therefore, the step will return to Step 716.

In above cases, we know if any exchange contains H, it will increasing large mobility (Registration 200 for 100_{C-H} and 100_{D-H}) , and any exchange of moving C to LA2, or D to LA2 , it also cost (at least 100 Registration). Therefore, we know that H and C and D with tight relationship, also of A and B. So any other Cases will not be better! Therefore Using Lee's solution (US 6,138,025) Fig7A and Fig7B, we cannot find any other move or swap step to improve the network.

But if we use DPU (Dynamic partition unit) algorithm, we can avoid trapping into local minimum by merging small partition unit to a bigger one partition unit. In the following case, we can try to merged PU_A and PU_B to be PU_{AB}, and then, we can choose PU_{AB} to move from LA2 to LA1.



Therefore,

Loading of LA1:

Paging Load of LA1 = $20_D+20_C+50_{A+B}+15_H=105$.

Registration Load of LA1 = $10_{AB-F}+10_{AB-E}+10_{AB-G}=30$.

Load (LA1) = 105 + 30 = 135. **(Not over capacity.)**

Loading of LA2:

Paging Load of LA2 = $30_E+40_F+30_E=100$.

Registration Load of LA2 =$10_{AB-F}+10_{AB-E}+10_{AB-G}$ =30.

Load (LA2) = 100+30 =130. **(Not over capacity.)**

Total loading of network is 135+130 =265. (Initial total load is 305, **be improved.)**

Clearly, we see this move will improve the total load of network and also make LAs to be more balance.

Thus, all pending claims are submitted to be in condition for allowance. The Examiner is encouraged to telephone the undersigned if there are informalities that can be resolved in a phone conversation, or if the Examiner has any ideas or suggestions for further advancing the prosecution of this case.

Respectfully Submitted,

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Dated: Sep. 1, 2008

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